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CLAIMS

What is claimed is:

1. A method of producing nitride based heterostructure devices comprising the steps of:

providing a substrate; and

applying a quaternary layer over the substrate wherein the quaternary layer includes In.

2. The method of claim 1, wherein the substrate comprises one of the group comprising sapphire, SiC, ZnO, a spinel substrate, Si, anodized alumina, and AlN.

3. The method of claim 1, wherein the quaternary layer further includes Al, Ga and N.

4. The method of claim 1, further comprising applying a second layer positioned between the substrate and the quaternary layer.

5. The method of claim 4, wherein the second layer includes GaN.

6. The method of claim 1, wherein the quaternary layer includes the compound AlInGaN.

7. The method of claim 6, wherein the quaternary layer includes about a 20% to 30% molar fraction of Al.

8. The method of claim 7, wherein the quaternary layer further includes about a 2% to 5% molar fraction of In.

9. A method of producing nitride based heterostructure devices comprising the steps of:

providing a substrate;

applying a first layer including GaN over the substrate;

applying a ternary layer over the first layer, wherein the ternary layer includes a compound selected from the group comprising AlGaN and InGaN; and

applying a quaternary layer over the ternary layer, wherein the quaternary layer includes AlInGaN.

10. The method of claim 9, wherein the substrate includes one of the group comprising sapphire, SiC, ZnO, a spinel substrate, Si, anodized alumina, and AlN.

11. The method of claim 9, wherein the quaternary layer includes about a 20% to about 30% molar fraction of Al.

12. The method of claim 11, wherein the quaternary layer further includes about a 2% to about 5% molar fraction of In.

13. A nitride based heterostructure device comprising:

a substrate;

a first layer applied over the substrate; and

a quaternary layer applied over the first layer wherein the quaternary layer includes In.

14. The device of claim 13, wherein the substrate includes one of the group comprising sapphire, SiC, ZnO, a spinel substrate, Si, anodized alumina, and AlN.

15. The device of claim 13, wherein the first layer includes GaN.

16. The device of claim 13, wherein the quaternary layer includes AlInGaN.

17. The device of claim 13, wherein the device is used as one of the group comprising of a field effect transistor, an ultraviolet light emitting diode, a visible light emitting diode, an ultraviolet light photodetector, a visible light photodetector, a dual infrared light emitter and detector, a dual ultraviolet light emitter and detector, a pyroelectric device, a piezoelectric device, a strain sensor, a stress sensor, and a plasma wave electronics device.

18. The device of claim 13 further comprising a ternary layer applied between the first layer and the quaternary layer.

19. The device of claim 18, wherein the ternary layer includes a compound selected from the group comprising AlGaN and InGaN.